Programming paradigms 1
Evaluation: primitive procedures

Miroslav Hruška

PALACKÝ
UNIVERSITY
OLOMOUC

Outline

$\mathsf{Eval}[+, \mathcal{P}_{\mathrm{G}}] = $ 'pr. proc. of sum.'

Outline

$\mathsf{Eval}[(+\ 1\ 2), \mathcal{P}_{\mathrm{G}}] = \ldots$

(+ 1 2)

$\text{Eval}[(+\ 1\ 2), \mathcal{P}_G] = \ldots$
$\quad\quad \text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Eval}[(+\ 1\ 2), \mathcal{P}_{\text{G}}] = \ldots$
$\quad\quad \text{Eval}[+, \mathcal{P}_{\text{G}}] = \text{'pr. proc. of sum.'}$
$\quad\quad \text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

(+ 1 2)

$\mathsf{Eval}[(+\ 1\ 2), \mathcal{P}_{\mathrm{G}}] = \ldots$

$\quad\quad \mathsf{Eval}[+, \mathcal{P}_{\mathrm{G}}] = {}'\mathsf{pr.\ proc.\ of\ sum.}'$

$\quad\quad \mathsf{Eval}[1, \mathcal{P}_{\mathrm{G}}] = 1$

$\quad\quad \mathsf{Eval}[2, \mathcal{P}_{\mathrm{G}}] = 2$

(+ 1 2)

$\text{Eval}[(+\ 1\ 2), \mathcal{P}_G] = \ldots$

$\quad\quad \text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\quad\quad \text{Eval}[1, \mathcal{P}_G] = 1$

$\quad\quad \text{Eval}[2, \mathcal{P}_G] = 2$

$\text{Apply}[\text{'pr. proc. of sum.'},\ 1,\ 2] = 3$

Outline

(+ 1 (+ 1 1))

Eval[(+ 1 (+ 1 1)), $\mathcal{P}_{\mathrm{G}}$] = . . .

(+ 1 (+ 1 1))

Eval[(+ 1 (+ 1 1)), $\mathcal{P}_{\mathrm{G}}$] = ...
    Eval[+, $\mathcal{P}_{\mathrm{G}}$] = 'pr. proc. of sum.'

$\text{Eval}[(+\ 1\ (+\ 1\ 1)), \mathcal{P}_\text{G}] = \ldots$
  $\text{Eval}[+, \mathcal{P}_\text{G}] = \text{'pr. proc. of sum.'}$
  $\text{Eval}[1, \mathcal{P}_\text{G}] = 1$

$\mathsf{Eval}[(+\ 1\ (+\ 1\ 1)), \mathcal{P}_\mathrm{G}] = \ldots$
  $\mathsf{Eval}[+, \mathcal{P}_\mathrm{G}] = \text{'pr. proc. of sum.'}$
  $\mathsf{Eval}[1, \mathcal{P}_\mathrm{G}] = 1$
  $\mathsf{Eval}[(+\ 1\ 1), \mathcal{P}_\mathrm{G}] = \ldots$

$Eval[(+\ 1\ (+\ 1\ 1)), \mathcal{P}_G] = \dots$
  $Eval[+, \mathcal{P}_G] = $ 'pr. proc. of sum.'
  $Eval[1, \mathcal{P}_G] = 1$
  $Eval[(+\ 1\ 1), \mathcal{P}_G] = \dots$
    $Eval[+, \mathcal{P}_G] = $ 'pr. proc. of sum.'

(+ 1 (+ 1 1))

$\text{Eval}[(+ 1 (+ 1 1)), \mathcal{P}_{\text{G}}] = \ldots$

$\qquad \text{Eval}[+, \mathcal{P}_{\text{G}}] = \text{'pr. proc. of sum.'}$

$\qquad \text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

$\qquad \text{Eval}[(+ 1 1), \mathcal{P}_{\text{G}}] = \ldots$

$\qquad\qquad \text{Eval}[+, \mathcal{P}_{\text{G}}] = \text{'pr. proc. of sum.'}$

$\qquad\qquad \text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

(+ 1 (+ 1 1))

$\text{Eval}[(+\ 1\ (+\ 1\ 1)), \mathcal{P}_\text{G}] = \ldots$
    $\text{Eval}[+, \mathcal{P}_\text{G}] = \text{'pr. proc. of sum.'}$
    $\text{Eval}[1, \mathcal{P}_\text{G}] = 1$
    $\text{Eval}[(+\ 1\ 1), \mathcal{P}_\text{G}] = \ldots$
        $\text{Eval}[+, \mathcal{P}_\text{G}] = \text{'pr. proc. of sum.'}$
        $\text{Eval}[1, \mathcal{P}_\text{G}] = 1$
        $\text{Eval}[1, \mathcal{P}_\text{G}] = 1$

(+ 1 (+ 1 1))

$\text{Eval}[(+ \ 1 \ (+ \ 1 \ 1)), \mathcal{P}_\text{G}] = \ldots$

$\quad \text{Eval}[+, \mathcal{P}_\text{G}] = \text{'pr. proc. of sum.'}$

$\quad \text{Eval}[1, \mathcal{P}_\text{G}] = 1$

$\quad \text{Eval}[(+ \ 1 \ 1), \mathcal{P}_\text{G}] = \ldots$

$\qquad \text{Eval}[+, \mathcal{P}_\text{G}] = \text{'pr. proc. of sum.'}$

$\qquad \text{Eval}[1, \mathcal{P}_\text{G}] = 1$

$\qquad \text{Eval}[1, \mathcal{P}_\text{G}] = 1$

$\quad \text{Apply}[\text{'pr. proc. of sum.'}, \ 1, \ 1] = 2$

$\text{Eval}[(+\ 1\ (+\ 1\ 1)), \mathcal{P}_{\text{G}}] = \dots$

    $\text{Eval}[+, \mathcal{P}_{\text{G}}] =\ $'pr. proc. of sum.'

    $\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

    $\text{Eval}[(+\ 1\ 1), \mathcal{P}_{\text{G}}] = \dots$

        $\text{Eval}[+, \mathcal{P}_{\text{G}}] =\ $'pr. proc. of sum.'

        $\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

        $\text{Eval}[1, \mathcal{P}_{\text{G}}] = 1$

    $\text{Apply}[$'pr. proc. of sum.'$,\ 1,\ 1] = 2$

$\text{Apply}[$'pr. proc. of sum.'$,\ 1,\ 2] = 3$

Outline

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_{\mathrm{G}}$] = . . .

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_\mathrm{G}$] = ...

  Eval[+, $\mathcal{P}_\mathrm{G}$] = 'pr. proc. of sum.'

Eval[(+ 1 + 1 1), $\mathcal{P}_{\mathrm{G}}$] = ...
    Eval[+, $\mathcal{P}_{\mathrm{G}}$] = 'pr. proc. of sum.'
    Eval[1, $\mathcal{P}_{\mathrm{G}}$] = 1

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_{G}$] = ...
  Eval[+, $\mathcal{P}_{G}$] = 'pr. proc. of sum.'
  Eval[1, $\mathcal{P}_{G}$] = 1
  Eval[+, $\mathcal{P}_{G}$] = 'pr. proc. of sum.'

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_G$] = ...
    Eval[+, $\mathcal{P}_G$] = 'pr. proc. of sum.'
    Eval[1, $\mathcal{P}_G$] = 1
    Eval[+, $\mathcal{P}_G$] = 'pr. proc. of sum.'
    Eval[1, $\mathcal{P}_G$] = 1

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_{\mathrm{G}}$] = ...
    Eval[+, $\mathcal{P}_{\mathrm{G}}$] = 'pr. proc. of sum.'
    Eval[1, $\mathcal{P}_{\mathrm{G}}$] = 1
    Eval[+, $\mathcal{P}_{\mathrm{G}}$] = 'pr. proc. of sum.'
    Eval[1, $\mathcal{P}_{\mathrm{G}}$] = 1
    Eval[1, $\mathcal{P}_{\mathrm{G}}$] = 1

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_G$] = ...

    Eval[+, $\mathcal{P}_G$] = 'pr. proc. of sum.'

    Eval[1, $\mathcal{P}_G$] = 1

    Eval[+, $\mathcal{P}_G$] = 'pr. proc. of sum.'

    Eval[1, $\mathcal{P}_G$] = 1

    Eval[1, $\mathcal{P}_G$] = 1

Apply['pr. proc. of sum.', 1, 'pr. proc. of sum.', 1, 1] =

(+ 1 + 1 1)

Eval[(+ 1 + 1 1), $\mathcal{P}_\mathrm{G}$] = ...

    Eval[+, $\mathcal{P}_\mathrm{G}$] = 'pr. proc. of sum.'

    Eval[1, $\mathcal{P}_\mathrm{G}$] = 1

    Eval[+, $\mathcal{P}_\mathrm{G}$] = 'pr. proc. of sum.'

    Eval[1, $\mathcal{P}_\mathrm{G}$] = 1

    Eval[1, $\mathcal{P}_\mathrm{G}$] = 1

Apply['pr. proc. of sum.', 1, 'pr. proc. of sum.', 1, 1] =

Error: The procedure was applied with other arguments than numbers.

Outline

Eval[(+ 1), $\mathcal{P}_{\mathrm{G}}$] = ...

(+ 1)

Eval[(+ 1), $\mathcal{P}_G$] = ...
    Eval[+, $\mathcal{P}_G$] = 'pr. proc. of sum.'

(+ 1)

$\text{Eval}[(+\ 1), \mathcal{P}_{\mathrm{G}}] = \dots$
$\qquad \text{Eval}[+, \mathcal{P}_{\mathrm{G}}] = \text{'pr. proc. of sum.'}$
$\qquad \text{Eval}[1, \mathcal{P}_{\mathrm{G}}] = 1$

(+ 1)

Eval$[(+ 1), \mathcal{P}_G] = \ldots$
    Eval$[+, \mathcal{P}_G] =$ 'pr. proc. of sum.'
    Eval$[1, \mathcal{P}_G] = 1$
Apply$['$pr. proc. of sum.$', 1] = 1$

Outline

(+)

$\mathsf{Eval}[(+), \mathcal{P}_{\mathrm{G}}] = \ldots$

(+)

$\text{Eval}[(+), \mathcal{P}_{\mathrm{G}}] = \ldots$
$\quad\quad \text{Eval}[+, \mathcal{P}_{\mathrm{G}}] = \text{'pr. proc. of sum.'}$

(+)

$\text{Eval}[(+), \mathcal{P}_G] = \dots$

$\quad \text{Eval}[+, \mathcal{P}_G] = \text{'pr. proc. of sum.'}$

$\text{Apply}[\text{'pr. proc. of sum.'}] = 0$

Outline

$((+))$

$\mathrm{Eval}[((+)), \mathcal{P}_{\mathrm{G}}] = \ldots$

((+))

$\mathsf{Eval}[((+)), \mathcal{P}_{\mathrm{G}}] = \ldots$
    $\mathsf{Eval}[(+), \mathcal{P}_{\mathrm{G}}] = \ldots$

$((+))$

$\mathsf{Eval}[((+)), \mathcal{P}_{\mathrm{G}}] = \ldots$
   $\mathsf{Eval}[(+), \mathcal{P}_{\mathrm{G}}] = \ldots$
      $\mathsf{Eval}[+, \mathcal{P}_{\mathrm{G}}] =$ 'pr. proc. of sum.'

((+))

Eval[((+)), $\mathcal{P}_{\mathrm{G}}$] = ...
    Eval[(+), $\mathcal{P}_{\mathrm{G}}$] = ...
        Eval[+, $\mathcal{P}_{\mathrm{G}}$] = 'pr. proc. of sum.'
    Apply['pr. proc. of sum.'] = 0

$((+))$

$\mathrm{Eval}[((+)), \mathcal{P}_{\mathrm{G}}] = \ldots$

$\quad\quad \mathrm{Eval}[(+), \mathcal{P}_{\mathrm{G}}] = \ldots$

$\quad\quad\quad\quad \mathrm{Eval}[+, \mathcal{P}_{\mathrm{G}}] = \text{'pr. proc. of sum.'}$

$\quad\quad \mathrm{Apply}[\text{'pr. proc. of sum.'}] = 0$

Error: The first element did not evaluate to proc. or spec. form.